Spirometry in general practice: the performance of practice assistants scored by lung function technicians

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SUMMARY

Recently, spirometers have become available for use within general practice as an alternative to peak flow meters. This study investigates whether practice assistants, after comprehensive training, can effectively carry out spirometry with patients suffering from asthma and other chronic obstructive pulmonary diseases. A scoring system, consisting of 20 items, was devised to determine the effectiveness of the assistants' instructions and to assess the patient's subsequent use of the spirometer. About half the instructions and half the patient performance items were considered to be carried out satisfactorily.

Keywords: lung function; spirometry.

Introduction

RECENT guidelines[1,2] for the diagnosis and treatment of asthma and chronic obstructive pulmonary disease (COPD) advise routine use of spirometry rather than peak flow measurement. However, it is only recently that spirometers have became available for use in general practice, and this raises the question of the possible implementation of spirometry in daily practice. One of the solutions is to delegate the spirometry — after proper instruction and supervision — to the practice nurse or the practice assistant (PA),[3] as these are qualified paramedical professionals. The aim of this study is to assess the effectiveness of delegating spirometry to PAs in a general practice setting.

Methods

Seventeen PAs received training and regular refresher courses in lung function measurement and were invited to participate in this study. Each PA was instructed to measure the FEV_1 (forced expiratory volume in the first second) and FVC (forced vital capacity) of three randomly selected patients who were aged over seventeen and who had had no previous experience of spirometry, using the Microplus® (Micromedical Instruments, Rochester, Kent, UK). Four PAs refused for personal reasons.

The instructions, and every attempt the patients made with the spirometer, were recorded on videotape by one of the authors (MK). Each set of videotaped instructions, and one randomly selected spirometry attempt for each patient, was then analysed and scored by seven experienced lung function technicians from two lung function laboratories. Scores were calculated for a list of 20 items (Table 1) developed from international spirometry guidelines. Items 1–13 focused on the instructions given by the PA and were scored as 'present', if given satisfactorily, or 'absent' otherwise; items 14–20 focused on aspects of a patients' performance and were scored as 'adequate' or 'inadequate'.

Ross' kappa (K) was used to estimate overall agreement between the lung function technicians. K coefficients > 0.60, implying good agreement, were taken to indicate a 'gold standard' level of judgement on the part of the technicians.[6] The spirometer used did not provide a flow-volume curve, so the quality and adequacy of the lung function measurement could only be assessed by observation. Mean percentages of 'present'/'adequate' scores were calculated as the number of 'present'/'adequate' scores divided by the total number of scored performances.

Results

Table 1 indicates the level of agreement between the lung function technicians, and the mean percentage of 'present' and 'adequate' scores. There was general agreement (K > 0.6) in 12 of the 20 items, and assessment was restricted to these. Regarding the instructions given by the PA before the exercise, items relating to upright posture, position of teeth and lips on the mouth piece, and duration of expiration were scored as 'present' (mean score > 50%, range 56.2–86.7); items relating to position of head, leaning, duration of expiration, encouragement, and demonstration of the FVC technique were scored as 'absent' (mean score ⩽50%, range 4.4–29.2). Regarding the performance of the spirometry exercise, items relating to position of patients' lips and to air leakage were scored as 'adequate' (mean score > 90%), but the quality of encouragement from the PAs was poor (mean score 13.5%).

Discussion

The reliability of spirometry depends largely on the instructor, which is a source of concern when introducing spirometry in primary care. Instructing and coaching the patient can minimize errors. This study analysed the quality of spirometry procedures handled by trained PAs and showed that about half of the instructions listed in Table 1 were given adequately. A major shortcoming was the PAs' failure to demonstrate the spirometry technique to the patients. Of the three items of patient performance over which there was general agreement among the lung function technicians, two were scored as 'adequate'. Here, the main failure was the PAs' lack of verbal encouragement of the

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Table 1. Kappa coefficients for each item of instruction or performance, with corresponding mean percentages of 'present' and 'adequate' scores.

Description of scored item	Kappa coefficient (K)	Standard error	Mean percentage 'adequate'/'present'
Instruction/encouragement items			
Adopt upright position	0.76	0.07	**86.7**
Keep head a little extended	0.84	0.08	**8.8**
Do not lean	0.84	0.06	**20.4**
Inhale as deeply as possible	0.25*	0.02	(60.8)
Hold teeth on mouth piece	0.61	0.02	**56.2**
Hold lips around mouth piece	0.72	0.07	**86.7**
Exhale as hard as possible	0.40*	0.07	(90.6)
Exhale as long as possible	0.66	0.06	**77.9**
Exhale until there is no air left in your lungs	0.75	0.04	**29.2**
Maintain upright position	0.45**	0.02	46.3
I will help and encourage you	0.72	0.09	**4.4**
Demonstration of FVC technique	0.65	0.08	**11.2**
Did you understand? Any questions?	0.30*	0.07	(9.0)
Performance items			
Full inspiration	0.14*	0.02	(59.6)
Quality of initial expiration	0.27*	0.02	(54.9)
Full expiration	0.53**	0.02	43.7
Position of teeth	0.53**	0.04	68.3
Position of lips	0.67	0.09	**93.4**
Air leaking around mouth piece	0.63	0.09	**94.1**
Quality of encouragement	0.64	0.07	**13.5**

*Kappa < 0.41 indicates poor agreement between the lung function technicians; no conclusion could be drawn regarding the instruction of the practice assistants (figures in brackets). **0.41 < Kappa < 0.6 indicates moderate agreement between the lung function technicians. Figures in bold refer to items for which there was good agreement (Kappa > 0.6).

patient during the spirometry exercise. PAs said they felt embarrassed with this item, as it reminded them of the behaviour of football coaches.

All 20 of the items examined were undoubtedly important, but some might be more important than others. No weighted scoring list was available, each item carrying the same weight. Difficulty in scoring an item does not indicate that it is unimportant.

A vital comment made by the lung function technicians concerned the display of a flow-volume curve, which is so critical in assessing the quality of the spirometry exercise in the laboratory. Spirometers available in general practice do not display the flow-volume curve, which puts PAs at a disadvantage. This underlines the importance of developing spirometers that do display such curves, especially for primary care. For the time being, however, practices will have to do without, and in this study PAs appeared capable, after training, of taking readings on spirometers without display curves. Demonstrating the spirometry exercise and verbally encouraging the patients are areas in which their performance could be further improved. However, regular performance review is necessary in order to enhance and safeguard the PA's contribution to the care of asthma and COPD patients.

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